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HIGHLY ALKALINE DETERGENT ADDITIVE BASED ON NAPHTHENIC ACIDS

A. M. Kuliev, et al

Foreign Technology Division
Wright-Patterson Air Force Base, Ohio

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by

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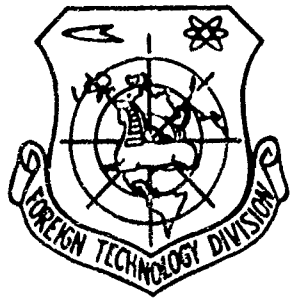

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13. ABSTRACT

This detergent additive is produced by an exchange reaction of the Na salts of naphthenic acids in the form of alkaline waste from purification of kerosene distillate and Caspian Sea water containing (g per 1) 2.95 $MgSO_4$, 0.56 $MgCl_2$, 0.28 $Ca(HCO_3)_2$ and 0.9 $CaSO_4$. 16-20 weight parts sea water are added to one weight part alkaline waste. The exchange reaction occurs instantaneously at about 20°. A party mass, containing Mg and Ca salts of naphthenic acid, is collected from the surface of the water, allowed to stand and pressed to remove water, then dissolved in four times excess quantity of a hydrocarbon solvent (ligroin, kerosene, petroleum oil) at 70-80°. After settling to remove water and mechanical impurities and drying at 120-130°, this solution produces the additive (IKhP-2 over 4) viscosity 51.8 cst per 100°, ash content 4.6%, alkalinity 115 Mg KOH per g, Mg 1.7%. Ca 1.2%. Diesel oil type D-11 with 8% IKhP-2-4 had detergent properties rated at 0-0.5 units when tested by the PZV (expansion unknown) method. Testing of D-11 oil + 8% IKhP-2-4 + 1% INKhP-21 (antioxidizing additive) gave better test results in the GAZ-51 engine (150 hours) as to smoothness of piston and mobility of rings than D-11 oil + 5% SB-3 (concentrate of petroleum Ca sulphonate) + 1% INKhP-21. [AR1030220]

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	ROLE	WT	ROLE	WT	ROLE	WT
Kerosene						
Diesel Fuel						
Lubricant Additive						
Fluid Viscosity						
Detergent Additive/(U)IKhP-24 Additive						
(U)SB-3 Lubricant Additive						
(U)D-11 Lubricant						
(U)PZV Testmethod						
(U)INKhP 21 Antioxidant Additive						
(U)GAZ-51 Engine						

EDITED TRANSLATION

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Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

* ye initially, after vowels, and after ъ, ь; e elsewhere. When written as ё in Russian, transliterate as yё or ё. The use of diacritical marks is preferred, but such marks may be omitted when expediency dictates.

HIGHLY ALKALINE DETERGENT ADDITIVE BASED ON NAPTHENIC ACIDS

A. M. Kuliyev, K. I. Sadykhov,
F. G. Suleymanova, R. A. Ibragimov,
N. F. Tuzhikova, and A. F. Aslanov

Various organic compounds including napthenates of metals, are used to improve the detergent properties of motor oils. There are methods of preparing metal napthenates by treating napthenic acids with different inorganic salts.

We synthesized a highly alkaline detergent additive made up of magnesium and calcium salts of napthenic acids. To synthesize this additive, the alkaline waste products of a kerosene distillate were used as initial products. These waste products contained 18-20% sodium salts of napthenic acids. An exchange reaction of the sodium salts of napthenic acids was carried out with Caspian Sea water containing 2.945 g/l $MgSO_4$, 0.556 g/l $MgCl_2$, 0.282 g/l $Ca(HCO_3)_2$ and 0.983 g/l $CaSO_4$.

The sea water treatment of the alkaline waste products of kerosene distillate makes it possible to prepare highly alkaline magnesium and calcium salts of napthenic acids.

The additive prepared on the basis of the magnesium and calcium salts of napthenic acids has high detergent and antiscale properties and surpasses the existing detergent additives SB-3 and SK-3 in these properties.

The additive based with the napthenate of magnesium and calcium is prepared thus:

Sea water is added to the alkaline waste products of kerosene distillate until the lower water layer clears. The magnesium and calcium salts of napthenic acids rise to the surface of the water in the form of a paste-like mass. The consumption of sea water per 1 kg of alkaline waste products is 16-20 l.

The exchange reaction of the sodium salts of napthenic acids for magnesium and calcium salts with the sea water occurs instantly, without any heating and stirring.

A paste-like mass collects on the surface of the sea water and is first freed of excess water by standing and pressing. Then this mass is dissolved in a weight ratio of 4:1 in a solvent (ligroin, kerosene, or oil) at a temperature of 70-80°C and allowed to stand to free it from water and mechanical impurities. The additive is subjected to final drying at a temperature of 120-130°C.

The additive prepared by this method was designated as additive IKhP-2/4. It is clear, dissolves well in lubricating oils and has the following basic qualities:

Viscosity, kinematic at 100°C	- 4.6 cSt
Ash content	- 4.6%
Water content	- Traces

Total alkalinity	- 115 mg KOH
Magnesium content	- 1.7%
Calcium content	- 1.2%

Results of the 150-hour tests on the GAZ-51 engine.

Indices	D-11 oil with 8% IKhP-2/4 and 1% INKhP-21	D-11 oil with 5% SB-3 and 1% INKhP-21
1. Ring wear, mg		
I	31.1	17.0
II	30.1	24.1
III	30.9	46.1
Total	92.1	87.2
2. Scale, g		
on rings	0.75	2.8
on grooves	0.42	2.0
Total	1.17	4.8
on the lateral surface	0.20	1.5
3. Varnish on piston skirt, points	2.0	4.6
4. Mobility of rings:		
frozen	-	1
tight	-	5
free	18	12

Diesel oil D-11 with 8% additive IKhP-2/4 has detergent properties by the PZV method (ruggedized method) of 0-0.5 points and a detergent potential of 60.

The table gives the results of testing D-11 oil with 8% additive IKhP-2/4 and 1% antioxidizing additive INKhP-21 in the GAZ-51 engine (150 hours) without changing the oil and with the fine filter disconnected.

D-11 oil in mixture with 5% additive SB-3 and 1% additive INKhP-21 was the standard.

As is evident from the data in the table, during the GAZ-51 engine test additive IkhP-2/4 in an 8% concentration provided considerably better condition of the engine in terms of piston cleanliness and ring mobility than additive SB-3.

Conclusion

A highly alkaline additive which provides high detergent and antiscale properties has been prepared with the magnesium and calcium salts of napthenic acids as its base.